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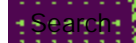
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How Extensive Is the Brain Drain?

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How extensive is the "brain drain," and which countries and regions are most strongly affected by it? This article estimates the extent of migration, by level of education, from developing countries to the United States and other OECD countries.

Perhaps the oldest question in economics is why some countries are rich while others are poor. Economic theory has emphasized that differences in the educational levels of the population are an important part of the answer and that improved schooling opportunities should raise incomes in developing countries. Yet, while there is little doubt that highly educated workers in many developing countries are scarce, it is also true that many scientists, engineers, physicians, and other professionals from developing countries work in Canada, the United States, and Western Europe. This phenomenon, often referred to as the "brain drain," was noticed as early as the 1960s and has been a contentious issue in the North-South debate ever since. One important implication of the brain drain is that investment in education in a developing country may not lead to faster economic growth if a large number of its highly educated people leave the country. Also, efforts to reduce specific skill shortages through improved educational opportunities may be largely futile unless measures are taken to offset existing incentives for highly educated people to emigrate.

But how extensive is the brain drain? Which countries and regions are especially affected? Do highly educated professionals from developing countries living abroad represent a sizable proportion of the pool of skilled workers in their countries of origin or too small a number to worry about? Unfortunately, attempts to answer these important questions quickly come up against a formidable barrier: there is no uniform system of statistics on the number and

characteristics of international migrants. Also, source countries typically do not keep track of emigrants' characteristics, and, although some receiving countries do, their definitions of immigration differ. Thus, it is difficult to measure precisely the flow and levels of education of immigrants. Further, it has only recently become possible to measure the stock of educated workers in each source country—the pool from which brainpower is drained.

Estimating the brain drain

Despite the lack of systematic data about international migrants, estimates of the stock of migrants by educational level in member countries of the Organization for Economic Cooperation and Development (OECD) can be constructed using a variety of data sources. The resulting estimates are less than perfect in many respects, but they significantly improve our knowledge of the magnitude of the brain drain. The study on which we based this article (Carrington and Detragiache, 1998) covers migration from 61 developing countries accounting for about 70 percent of the total population of developing countries. Because of the lack of data, we have not attempted to estimate the extent of either the brain drain from the former Soviet Union and Eastern Europe, even though casual evidence suggests that it is substantial, or migratory flows among developing countries. We followed a two-step procedure: first, estimates of the brain drain to the United States were constructed using 1990 U.S. census data and other sources of information. Then, these estimates were used—together with data on migrants to OECD countries other than the United States drawn from the OECD's Continuous Reporting System on Migration—to estimate the extent of the brain drain to all OECD countries. While the resulting estimates should be reasonably precise for migration to the United States (which accounts for 54.3 percent of the total migration from the developing countries in our sample to all OECD countries), they are much more tentative for the brain drain to all OECD countries.

The U.S. census reports whether individuals polled are foreign born and, if they are, what their country of origin is; the number of years of schooling received is also reported for each individual. After individuals under 25 years of age are eliminated to ensure compatibility with the data on educational attainment described below, all foreign-born individuals in the census are put into one of three broad educational categories: primary (0 to 8 years of schooling), secondary (9 to 12 years of schooling), and tertiary (more than 12 years of schooling). A further adjustment involves

subtracting from the group of foreign-born individuals with a tertiary education all graduate students in U.S. universities, using data from the Institute of International Education. This procedure yields, for each developing country in the sample, the number of migrants in the United States in each of the three educational categories. To assess the extent of the brain drain from each country considered, these estimates must be compared with the number of individuals in each educational group who remain in their home country. Doing this requires a breakdown by educational category of the population of each developing country in the sample, for which we rely on a data set recently assembled by Robert Barro and Jong-Wha Lee (Barro and Lee, 1993), which provides the best estimates available to date of educational attainment for individuals more than 25 years of age in a large sample of countries.

Brain drain to the United States

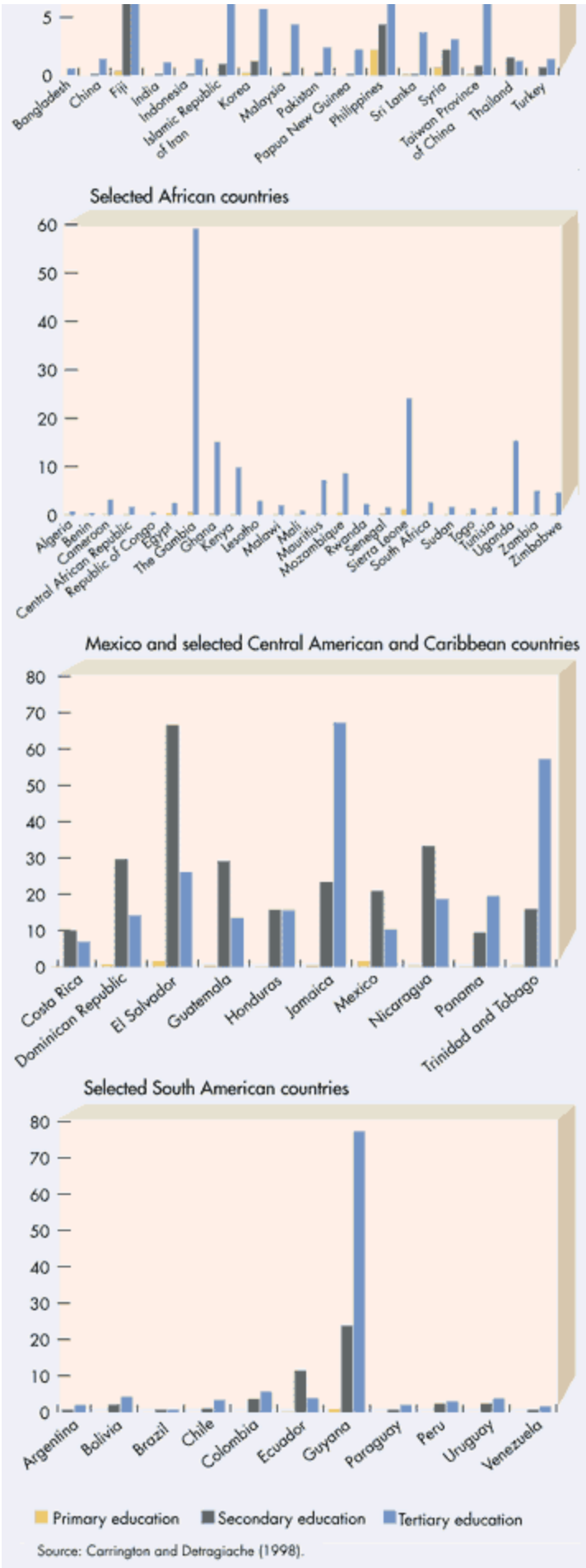
The first striking feature of the U.S. migration data is that immigration flows of individuals with no more than a primary education are quite small, both in absolute terms and relative to other educational groupings (about 500,000 individuals out of a total of 7 million immigrants). Foreign-born individuals with little or no education, however, may be undercounted by the census if they are in the country illegally or do not speak English. The largest group of immigrants into the United States (about 3.7 million) consists of individuals with secondary education from other North American countries (understood here to include Central American and Caribbean countries), primarily Mexico. Perhaps surprisingly, the second largest group (almost 1.5 million individuals) consists of highly educated migrants from Asia and the Pacific. Total immigration from South America and, especially, Africa is quite small. It is noteworthy, however, that immigrants from Africa consist primarily of highly educated individuals (about 95,000 of the 128,000 African migrants).

Among the countries in Asia and the Pacific, the biggest source is the Philippines, with 730,000 migrants. Of these, the great majority have a tertiary education. The second largest stock of migrants is from China (400,000), which is split almost equally between the secondary and tertiary educational groups. Both India and Korea have seen more than 300,000 people migrate to the United States. It is striking that more than 75 percent of Indian immigrants have a tertiary education, compared with only 53 percent of Korean immigrants.

The biggest migratory flows from Africa to the United States

are from Egypt, Ghana, and South Africa, with more than 60 percent of immigrants from those three countries having a tertiary education. Migration of Africans with only a primary education is almost nil. The picture is quite different for the migratory flows from the Western Hemisphere: Mexico is by far the largest sending country (2.7 million), with the large majority of its migrants (2.0 million) having a secondary education and fewer than 13 percent having a tertiary education. This pattern is also observed for the smaller countries of Central America, but not for the two Caribbean countries for which we have information, for which migrants with a tertiary education are a more substantial percentage of the total (42 percent for Jamaica and 46 percent for Trinidad and Tobago). Finally, migration from South America to the United States is relatively small in absolute numbers, with immigrants split almost equally between the secondary and the tertiary educational groups.

In each sending country, how do the numbers of emigrants compare with the size of the population with a given educational attainment? For most countries, people with a tertiary education have the highest migration rate, with the exceptions of the Central American countries, Ecuador, and Thailand (in Thailand, people with a secondary education and those with a tertiary one have approximately the same migration rates) (see [chart](#)). Thus, migrants to the United States tend to be better educated than the average person in their home (that is, the sending) country, and the proportion of very highly educated people who migrate is particularly high. Also, migration from Central America seems to follow a somewhat different pattern than migration from other developing countries, in that the highest migration rate is for persons with a secondary education, rather than those with a tertiary education.



The brain drain to the United States from many Central American and Caribbean countries is substantial: for persons with a tertiary education, immigration rates for virtually all these countries are above 10 percent, and some appear to be 50 percent or even higher. In South America, the country with by far the largest brain drain is Guyana, from which more than 70 percent of individuals with a tertiary education have moved to the United States; for the rest of the region, the immigration rates for this educational group are much lower. The Islamic Republic of Iran has had a substantial drain of highly educated individuals (more than 15 percent) and so has Taiwan Province of China (8–9 percent).

Brain drain to other OECD countries

To construct estimates of the brain drain from developing countries to OECD countries, we have relied on the OECD Continuous Reporting System on Migration. Unfortunately, unlike the U.S. census, this data source does not report the years of schooling that migrants have received. For lack of any practical alternatives, we have assumed that the distribution of immigrants by educational category from each source country is the same for the United States as for other OECD countries. Although this is the only feasible approach, which often produces numbers that are consistent with anecdotal evidence, there are some instances in which it yields implausible results, particularly for countries with low rates of immigration to the United States but high rates to one or more of the other OECD countries. Immigrants to the United States from such countries are likely to be better educated than immigrants to other OECD countries, who thus may be more representative of the source country's population.

A second problem with the data for OECD countries other than the United States lies in the different criteria for classifying individuals as immigrants. Although Australia, Canada, and the United States define an immigrant as a person who was born abroad to noncitizens, most European countries define immigrant status based on the ethnicity or immigration status of the parent. A third difficulty with the OECD data is that they did not permit us to exclude immigrants under the age of 25. Finally, the OECD records immigrants from only the top 5 or 10 countries from which they come to each OECD country. Thus, for example, the OECD figures for Canada would include specific information on the numbers of immigrants from China and Mexico, but not those from Jamaica and El Salvador. This is a problem when emigration flows are significant for the source country but small for the receiving country. Thus, particularly for small

countries, our estimates of immigration to OECD countries other than the United States may be seriously understated.

If, as a rule of thumb, we consider estimates to be unreliable when migrants to the United States account for less than one-third of the total of immigrants to all OECD member countries, then all estimates for immigration from the Asian and Pacific countries are reliable with the exceptions of those for Malaysia and Sri Lanka. Turkey is also an exception. Among the remaining countries, the extent of the brain drain to all OECD members is substantial—and it increases significantly compared with the U.S. data—for the Islamic Republic of Iran, Korea, and, to a lesser extent, the Philippines. For the Islamic Republic of Iran, the fraction of the population with a tertiary education living in OECD countries is around 25 percent; for Korea, 15 percent; and for the Philippines, about 10 percent. For Pakistan, the migration rate of individuals with a tertiary education is more than 7 percent, while for India it is about 2.7 percent; these figures, however, fail to take into account the sizable flow of professionals from the Indian subcontinent to Bahrain, Kuwait, Oman, Qatar, and the United Arab Emirates and therefore neglect an important component of the brain drain from the relevant source countries. The migration rate of highly educated individuals from China is about 3 percent.

For Africa, the estimates are unreliable for Algeria, Senegal, and Tunisia, from which migrants go mainly to France. For most other countries in the sample, however, migration to OECD countries other than the United States is quite small, so the results derived for the United States remain essentially valid. There are, however, some exceptions: for Ghana, the migration rate of highly educated individuals is a dramatic 26 percent; for South Africa, it is more than 8 percent; for Egypt, the brain drain includes 2.5 percent of such individuals emigrating to the United States and another 5 percent emigrating to other OECD countries. For countries in the Western Hemisphere, the bulk of migration is to the United States, and inclusion of flows to the rest of the OECD makes little difference. The only exception is Jamaica, which has a considerable stock of migrants living in the United Kingdom. The drain from Jamaica's population with secondary education is 33 percent, while that from its population with tertiary education is more than 77 percent.

Conclusion

Our estimates show that there is an overall tendency for migration rates to be higher for highly educated individuals.

With the important exceptions of Central America and Mexico, the highest migration rates are for individuals with a tertiary education. A number of countries—especially small countries in Africa, the Caribbean, and Central America—lost more than 30 percent of this group to migration. We have also found a sizable brain drain from Iran, Korea, the Philippines, and Taiwan Province of China. These numbers suggest that in several developing countries the outflow of highly educated individuals is a phenomenon that policymakers cannot ignore.

More research, especially empirical studies, is needed to evaluate the impact of the brain drain on source economies and on worldwide welfare, as well as the reasons for such migration. In regard to the latter subject, immigration policies in OECD countries tend to favor better-educated people, which may explain why the *educational composition* of total migration is skewed toward the better educated but cannot explain why so many skilled workers are willing to leave developing countries. Wage differentials may be part of the explanation, but this raises the question of what accounts for such differentials. Differences in the quality of life, educational opportunities for children, and job security may also play a role, as may the desire to interact with a broader group of similarly skilled colleagues. Another important issue is the extent to which the benefits of education acquired by citizens of developing countries are externalities that individuals cannot be expected to take into account when making their private decisions. If such externalities are substantial, as is emphasized by the "new growth theory," then policies to curb the brain drain may be warranted.

Our research also indicates several ways in which estimates of the brain drain could be improved using existing data. The first would be to use census information for other large immigrant receiving countries, such as Australia, Canada, France, and Germany. Together with the United States, these four countries account for about 93 percent of total migratory flows to OECD countries, so the resulting figures would be a very good approximation of the total. Another promising direction for future research would be to try to obtain, from census data or other sources, more detailed information about the occupational categories of highly skilled migrants, in order to assess whether the brain drain from a given country is especially marked for particular professional groups. This type of analysis could be useful for evaluating the problems that policy programs—such as health sector reform, financial liberalization, or civil service reform—may encounter in developing countries.

Suggestions for further reading:

Robert J. Barro and Jong-Wha Lee, 1993, "International Comparisons of Educational Attainment," Journal of Monetary Economics, Vol. 32 (March), pp. 363-94.

William J. Carrington and Enrica Detragiache, 1998, "How Big Is the Brain Drain?" IMF Working Paper 98/102 (Washington).

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